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Remarks

Thorough examination by the Examiner is noted and appreciated.

The claims have been further amended to overcome Examiners 112 rejections and clarify claim language.

No new matter has been added.

Support for the amendments is found in the previously presented claims, the Figures, including Figure 5, and in the Specification at:

Line 6, beginning on page 16:

"It will be appreciated by those skilled in the art that the nozzle head 50 **separates the primary gas stream 72 into the multiple secondary gas streams 72a, which strike the surface of the liquid primer 42 in a dispersed pattern that generally matches the pattern of the nozzle openings 58 in the nozzle plate 56.** Accordingly, each of the multiple secondary gas streams 72a strikes the liquid primer 42 at a substantially reduced gas pressure of typically about 0.75 Kpa. This optimizes generation of primer vapor 60 in the tank body 41 while preventing or substantially reducing the formation of liquid primer droplets which would otherwise be drawn with the primer vapor 60 into the process chamber 64 through the vapor outlet tube 70 and contaminate the wafer substrate 66 therein. Consequently, the primer layer 62 deposited on the substrate 66 is substantially **uniform in thickness and lacks liquid primer droplets** which would

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otherwise cause uneven etching of a photoresist layer (not shown) deposited on the primer layer 62 in subsequent processing steps."

**Claim Rejections under 35 USC 112**

Claims 1-3, 5, 9-11, 13 and 17-25 stand rejected under 35 U.S.C. 112 second paragraph as failing to particularly point out and distinctly claim the subject matter which Applicants regard as their invention.

Examiner asserts that the amended claims language "directing a plurality of streams in a **planar dispersed pattern**" as the amended claims 1 and 17 as reproduced below I not supported in the specification and is new matter:

"shown below a nozzle assembly comprising a nozzle plate, said nozzle plate comprising a plurality of openings, said plurality of openings disposed above said planar exposed surface and arranged for directing a plurality of gas streams in a planar dispersed pattern onto said planar exposed surface to form said primer vapor in a vapor collection space above said liquid vapor interface. The claims have been amended to overcome Examiners rejection."

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However, Examiner has not rejected under Section 112, first paragraph, but rather under Section 112, second paragraph.

Examiner conveniently rewrites Applicants claims arguing if Applicants had 'accurately claimed' what was disclosed they would have claimed "directing a plurality of gas streams to strike the planar exposed surface in a dispersed patter that generally matches the pattern of the openings in the nozzle plate".

After having conveniently rewritten Applicants claims to eliminate the planar patter of nozzles that is shown in Figure 1, and is not disclosed or suggested by Harada, Examiner then finds that Examiner rewritten claims language is shown by Harada.

Examine4r has not explained exactly what is unclear about "directing said plurality of openings disposed above said planar exposed surface and arranged for directing a plurality of gas streams in a planar dispersed pattern onto said planar exposed surface", or how one of ordinary skill would not understand the plain meaning of the language of "a plurality of openings arranged for directing a plurality of gas streams in a planar dispersed pattern onto said planar exposed surface" or how the claim language would not be understood by one of ordinary skill

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in the art as being disclosed by Applicants.

Examiner erroneously argues that Applicants specification describes "a pattern that is on the surface of the liquid when it is struck as described in lines 5-21 of page 16 of the Specification:

"It will be appreciated by those skilled in the art that the nozzle head 50 separates the primary gas stream 72 into the multiple secondary gas streams 72a, which strike the surface of the liquid primer 42 in a dispersed pattern that generally matches the pattern of the nozzle openings 58 in the nozzle plate 56. Accordingly, each of the multiple secondary gas streams 72a strikes the liquid primer 42 at a substantially reduced gas pressure of typically about 0.75 Kpa. This optimizes generation of primer vapor 60 in the tank body 41 while preventing or substantially reducing the formation of liquid primer droplets which would otherwise be drawn with the primer vapor 60 into the process chamber 64 through the vapor outlet tube 70 and contaminate the wafer substrate 66 therein. Consequently, the primer layer 62 deposited on the substrate 66 is substantially uniform in thickness and lacks liquid primer droplets which would otherwise cause uneven etching of a photoresist layer (not shown) deposited on the primer layer 62 in subsequent processing steps."

Of Course Examiner ignores the fact that the nozzle head 50 is discloses to have a planar pattern of openings that are arranged to direct a plurality of gas streams in a planar dispersed pattern onto said planar exposed surface "that generally matches the pattern of the nozzle plate".

Thus, Examiner is simply failing to interpret the plain meaning of Applicants claim language and is ignoring the plain meaning of Applicants disclosure.

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Nevertheless, the claims have been further amended in an effort to make the plain meaning of Applicants claim language clearer.

**Claim Rejections under 35 USC 103(a)**

1. Claims 1, 2, 5, 9, 11, 17, 18, 20, 22, 23 and 24 stand rejected under USC 103(a) as being as obvious over Harada (6,402,844 in view of Fukada (5,733,375).

Harada et al. disclose a vapor generator and a method for carrying out vapor generation of HDMS in order to treat a semiconductor wafer in a down stream process. The apparatus and the method of Harada et al. overcome the problem of a reduction of the temperature of the heated wafer in the process chamber as vapor is passed from the vapor generator to the wafer treatment chamber (see Abstract; col 1, lines 51- col 2, line 8). Harada disclose intermittently supplying the vapor from the vapor generator, and where the process chamber is being evacuated while the vapor is being supplied (col 2, lines 34-44; col 4, lines 28-35) and the exhaust or evacuation is stopped at the same time the vapor supply is stopped (col 4, lines 36-54).

Harada et al. disclose that the vapor generator (Figure 6)

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may have a plurality of nozzles (**shown in cross section in a linear pattern**) as opposed to a single nozzle (item 33, Figure 1) in order to **increase the amount of N2 sprayed on the surface** of the HDMS solution compared to one nozzle (i.e., to increase the concentration of HDMS supplied to the process chamber (col 6, lines 35-45). Harada et al. further teach that when the vapor is not being supplied to the process chamber the concentration of HDMS continues to evaporate and increase in the vapor (col 5, lines 7-20).

Harada et al. fails to disclose several elements of Applicants disclosed and claimed invention including those elements in **bold type**:

With respect to claims 1:

" A primer tank for generating a primer vapor for treating a substrate **with reduced primer droplet formation and improved deposition uniformity of said primer vapor on said substrate** comprising:

a tank body for containing a liquid primer to form a planar exposed surface of said liquid primer, said planar exposed surface comprising a liquid vapor interface; and,

a nozzle assembly comprising a nozzle plate, **said**

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nozzle plate comprising a plurality of openings arranged in a planar dispersed pattern, said plurality of openings disposed above said planar exposed surface and arranged for directing a plurality of gas streams from said planar dispersed pattern onto said planar exposed surface to form said primer vapor in a vapor collection space above said liquid vapor interface."

With respect to claim 17:

"A method of generating a primer vapor from a liquid primer for treating a substrate to reduce primer vapor droplet formation and improved deposition uniformity of said primer vapor on said substrate comprising the steps of:

providing a primer tank having a tank body;

providing the liquid primer in said tank body to form a planar exposed surface of said liquid primer, said exposed surface comprising a liquid vapor interface;

directing an inert gas comprising a plurality of gas streams from a plurality of openings, said plurality of openings comprising a planar dispersed pattern formed in a plate surface of a nozzle plate, said plurality of gas streams directed onto said planar exposed surface to form a vapor above said liquid

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vapor interface, said vapor comprising said liquid primer and said inert gas; and,

transferring said vapor to a downstream process to deposit said vapor on said substrate."

Examiner argues that "the nozzle assembly is formed integrally in the ceiling of the tank", but point to not citation supporting such an assertion (there is not discussion or suggestion in Harada et al. that the nozzles (33) are integrally formed). Examiner then argues that the ceiling of the tank "can obviously be in the form of a plate" and therefore "can obviously be a nozzle plate" comprising a plurality of openings". However, Harada et al. **disclose a linear pattern of nozzles** (see Figure 6) and nowhere disclose or suggest a planar dispersed pattern of nozzles or openings in a nozzle plate.

Moreover, nowhere do Harada et al. recognize or proved a solution to the problem that Applicants have recognized and solved:

"A primer tank for generating a primer vapor for treating a substrate **with reduced primer droplet formation and improved deposition uniformity of said primer vapor on said substrate**"



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Rather the teachings of Harada et al. teach more nozzles for increasing an amount of N2 supplied (i.e., higher flow rates/pressure) **would create the very problem that Applicants have recognized and solved.**

Examiner state that "Fukada has been added to illustrate that is was known in the prior art that the ceiling of an HMDS vaporizer can successfully be formed as a plate". However, Fukada discloses a **single pipe (110; Figure 6)** for supplying nitrogen gas where the single pipe extends through an opening (27) (col 8, lines 18-26) in the cap (21).

Even assuming arguendo a proper motivation for combining the teaches of Harada et al. and Fukada, the fact that either Harada or Fukada disclose that the ceiling of the vaporizer tank is a plate or that a single or a linear arrangement of pipes may extend through the plate does not further disclose or suggest Applicants invention.

**"First,** there must be some **suggestion or motivation,** either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second,** there must

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be a **reasonable expectation of success**. Finally, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaecck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Examiner is mistaken in asserting "the upstream end of the nitrogen gas supply line in Figure 6 of Harada is "a gas inlet pipe for receiving a primary gas stream" or that Figure 6 shows a manifold section. Rather Harada shows arrows representing a supply of N2 to the individual pipes (33) that extend through the top surface of the vaporizer body (31) without any **manifold present**, as the plain meaning of that term would be understood by one of ordinary skill in the art.

Examiner is further failing to give the plain meaning of Applicants terms the plain meaning they are entitled to, and asserts non-existent disclosure in Harada by arguing that Figure 6, of Harada discloses with respect to claim 9:

"a nozzle plate in downstream fluid communication with said housing, **said nozzle plate having a plurality of openings**

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comprising a planar dispersed pattern, said planar dispersed pattern adapted to receive the primary gas stream and eject a plurality of secondary gas streams onto said planar exposed surface to create a primer vapor in a vapor collection space above said exposed surface"

It is clear that by giving Applicants terms their plain meaning that the individual gas supply pipes of Harada do not disclose Applicants claimed invention.

See e.g., MPEP 2111.01:

During examination, the claims must be interpreted as broadly as their terms reasonably allow. **This means that the words of the claim must be given their plain meaning unless applicant has provided a clear definition in the specification.** *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

When not defined by applicant in the specification, the words of a claim must be given their plain meaning. In other words, they must be read as they would be interpreted by those of ordinary skill in the art. *In re Sneed*, 710 F.2d 1544, 218 USPQ 385 (Fed. Cir. 1983).

Further with respect to claims 2, Examiner is mistaken that Harada discloses Applicants claimed structure including those elements in **bold type**:

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**"wherein said planar disperse pattern comprises said plurality of openings disposed in a plurality of radially extending rows on a plate surface of said nozzle plate."**

Examiner argues that "it is noted that Figure 6 of Harada is a schematic diagram and that the particular number of openings and the particular location of the opening would have been prima facie obvious matter of choice for one skilled in the art"

Examiner cites no case law or MPEP portion where the above statement is recognized as a standard for an obviousness determination. Examiner is required to show some suggest or motivation in the prior art, some expectation of success, and finally all of applicants claimed limitations. The mere fact that something could have been done is insufficient.

Moreover, Examiner has not shown in the prior art a recognition of the problem solved by Applicants structure or a teaching or suggestion that Applicants structure is desirable, or would successfully accomplish a particular result.

As noted above, Harada et al. discloses a plurality of **linearly arranged** nozzles (in cross section) to allow an **increased amount (flow) of N2 gas to be directed at the surface**

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(i.e., with **increased droplet formation**), thereby presenting the very problem that Applicants invention solves.

"**First**, there must be some **suggestion or motivation**, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a **reasonable expectation of success**. **Finally**, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

"The mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device." *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984).

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2. Claims 3 and 10 stand rejected under 35 USC 103(a) as being unpatentable over Harada et al. in view of Fukada, above, in further view of Applicants description of the prior art.

Applicants reiterate the comments made above with respect to Harada et al. and Fukada.

Even assuming arguendo a proper motivation for combining Applicants description of the prior art with Harada et al., such combination does not produce or suggest Applicants disclosed and claimed invention.

The fact that Applicants discussion that liquid level sensors were known in the prior art is no sufficient to support a finding of obviousness, or to modify Harada et al.

"The fact that references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references." *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

"Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The

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teaching or suggestion to make the claimed combination and the reasonable expectation of success **must both be found in the prior art, and not based on applicant's disclosure.**" *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

3. Claim 19 stands rejected under 35 USC 103(a) as being unpatentable over Harada et al. in view of Fukada, above, in further view of Applicants description of the prior art.

Applicants reiterate the comments made above with respect to Harada et al., Fukada and Applicants description of the prior art.

Examiner points to no motivation, other than impermissibly Applicants disclosure to find motivation to modify Harada et al. Moreover, Harada et al. nowhere suggests or discloses that their process could be successfully carried out at subatmospheric pressures, rather, Harada et al. disclose that the HDMS is supplied to the treatment chamber 2 **at atmospheric pressure**, thereby also **disclosing the N2 gas is supplied to the HDMS vaporizer chamber 31 at atmospheric pressure** (see col 5, lines 31-35).

"Finally, the prior art reference (or references when

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combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success **must both be found in the prior art**, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

4. Claims 1, 2, 5, 9, 11, 13, 17, 18, and 20-25 stand rejected under 35 USC 103(a) as being unpatentable over Harada et al. in view of Fukada, above, in further view of Bowles (853,915).

Applicants reiterate the comments made above with respect to Harada et al. and Fukada

Even assuming arguendo, Bowles is analogous art, and a proper motivation for modifying Harada et al. with Bowles, the fact that Bowles teaches a **carburetor for supplying carbureted air** to an engine where **air supply pipes (7)** are supplied to chambers (3) separated by a partition (2a) **to prevent violent splashing "from one end of the compartment to another"** (page 1, lines 65-70) and teaches a pair of perforated partitions (2, 11) (Fig 1, Fig 4) forming a **mixing chamber** (gas collection space) above the gasoline surface to collect the carbureted air and then passing the carbureted air (from the mixing chamber) downstream **in response to periodic suction (including periodic backpressure)**



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produced by the engine cycles downstream (see page 1, lines 86-95; page 2, lines 25-45; lines 54-57), does not further help Examiner in producing Applicants invention.

For example, modifying Harada et al. with the perforated partitions and the mixing chamber of Bowles would make the plurality of nozzles of Harada et al. unsuitable for their intended purpose of supplying an increased flow rate (amount) of N2 to the HDMS surface, since the perforated partitions and mixing chamber over the surface of the HDMS liquid would take up most of the area over the HDMS liquid of Harada et al..

"**First**, there must be some **suggestion or motivation**, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a **reasonable expectation of success**. **Finally**, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

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"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious." *In re Ratti*, 270 F.2d 810, 123, USPQ 349 (CCPA 1959).

"If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Examiner suggests using the gas collection space and mixing chamber of Bowles (including the perforated partitions) in place of the linear nozzles of Harada, and erroneously argues that the nozzle plate (4) (see Figure 2, 4) **is an integral part of a carrier gas supply manifold.**

Examiner is clearly misreading the teachings of Bowles who teaches that the **gas is supplied by single pipes 7** (i.e., there is no manifold) and that the perforated partitions (4) which Examiner erroneously refers to as a nozzle plate. Rather, the perforated partitions (4) (see Figure 2) **is in a mixing chamber for collecting the evaporated gas** (page 1, lines 95-100; page 2,

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lines 30-37).

Examiner is clearly mistaken in the assertion that Bowles anywhere teach that perforated plate is a nozzle plate or that it successfully accomplishes the goals of Harada et al. (supplies gas to a surface of HDMS liquid to effect evaporation). As noted the perforated plates of Harada et al. collects evaporated gas and is in a mixing chamber above the surface of the gas or vertically separates separate gas containing chambers (perforated plates 2 in Figure 2).

Thus, Bowles nowhere suggests or discloses:

"a nozzle assembly comprising a nozzle plate, said nozzle plate comprising a plurality of openings in a planar dispersed pattern, said plurality of openings disposed above said planar exposed surface and **arranged to direct a plurality of gas streams in said planar dispersed pattern from said plurality of openings onto said planar exposed surface** to form said primer vapor in a vapor collection space above said liquid vapor interface."

"**First**, there must be some **suggestion or motivation**, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the

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reference or to combine reference teachings. **Second**, there must be a **reasonable expectation of success**. **Finally**, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

5. Claims 3 and 10 stands rejected under 35 USC 103(a) as being unpatentable over Harada et al. in view of Fukada and Bowles, above, in further view of Applicants discussion of the prior art. Applicants reiterate the comments made above with respect to Harada et al., Fukada, Bowles and Applicants discussion of the prior art.

Even assuming arguendo a proper motivation for combining Applicants description of the prior art with Harada et al., such combination does not produce or suggest Applicants disclosed and claimed invention.

The fact that Applicants discussion that liquid level sensors were known in the prior art is no sufficient to support a finding of obviousness, or to modify Harada et al.

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"The fact that references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references." *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

6. Claim 19 stands rejected under 35 USC 103(a) as being unpatentable over Harada et al. in view of Fukada, above, in further view of Applicants description of the prior art.

Applicants reiterate the comments made above with respect to Harada et al., Fukada and Applicants description of the prior art.

Examiner points to no motivation, other than impermissibly Applicants disclosure to find motivation to modify Harada et al. Moreover, Harada et al. nowhere suggests or discloses that their process could be successfully carried out at subatmospheric pressures, rather, Harada et al. disclose that the HDMS is supplied to the treatment chamber 2 at atmospheric pressure, thereby also disclosing the N2 gas is supplied to the HDMS

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vaporizer chamber 31 at atmospheric pressure (see col 5, lines 31-35).

"**First**, there must be some **suggestion or motivation**, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a **reasonable expectation of success**. **Finally**, the prior art reference (or references when combined) **must teach or suggest all the claim limitations**. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

#### Examiners Arguments

Examiner misunderstands Applicants previous arguments. Applicants have previously argued and maintain the argument that the prior art nowhere suggest or discloses Applicants structure or method including Applicants nozzle plate including "comprising a plurality of openings arranged a planar dispersed pattern".

Examiner further has nowhere shown in the prior art a

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recognition of the problem, or a solution thereto that Applicants have recognized and solved by their disclosed and claimed invention.

"A primer tank for generating a primer vapor for treating a substrate **with reduced primer droplet formation and improved deposition uniformity** of said primer vapor on said substrate"  
or

"A method of generating a primer vapor from a liquid primer for treating a substrate to **reduce primer vapor droplet formation and improved deposition uniformity** of said primer vapor on said substrate"

Moreover, Examiner asserts erroneously and without support, and fails to state a standard for making out a prima facie case of obviousness: that the perforated partition plates of Bowles to prevent undesirable production of liquid particles "is also applicable to Harada's vaporizer, because it was known in the art that droplet formation was undesirable in and HDMS vaporizer of the type taught by Harada and Fukada."

First, the perforated plates of Bowles are not used to deliver a gas stream but to collect an evaporated gas stream,

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thus **working by a different principle of operation.**

Secondly, Examiner has shown no teaching in the prior art, and there exists none, that "droplet formation was undesirable in and HDMS vaporizer of the type taught by Harada and Fukada". None of the cited references teaches or supports such a conclusion by Examiner. Rather, Examiner has impermissibly found the above teaching in Applicants disclosure.

Finally, there is no suggestion in any of the references that would suggest modification of Harada and Fukada to achieve Applicants disclose structure or method. But rather the teachings (structure) of the cited references all present the very problem that Applicants invention has overcome.

#### Conclusion

The cited references, either singly or in combination, do not produce or suggest Applicants disclosed and claimed invention, and therefore fail to make out a *prima facie* case of obviousness.

The Claims have been amended to further clarify Applicants' disclosed and claimed invention. Applicants respectfully request



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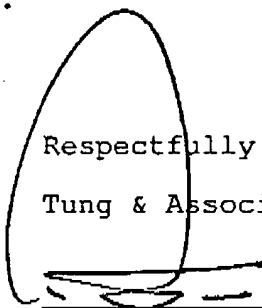
a favorable reconsideration of Applicants' claims.

Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

In the event that the present invention as claimed is not in condition for allowance for any reason, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

Tung & Associates



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